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FIELD TESTING AN EXPERIMENTAL VIDEODISC WITH ELEMENTARY SCHOOL CHILDREN

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REPORTS

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Final Report

Project: "Field Testing An Experimental Videodisc With Elementary School Children"

Simon Fraser University videodisc project involved the design and field testing of their experimental videodisc titled "How Your Heart and Circulatory System Works." The results of this project are presented in two reports. Part One, "Design and Production of an Interactive Videodisc for Elementary School Children," appeared in the Fall issue of the Videodisc/Videotex[1] journal and described how various types of audiovisual materials were designed to exploit the new features of this multidimensional and interactive learning system.

This second report is a summary of two field studies conducted in two elementary schools in British Columbia, Canada.[2] The pilot study began in January, 1982 and was completed in two months. Information gained from this initial project provided a format for the design of the second observational study. The latter study began on March 1, 1982 and included the development of a videodisc laboratory, two inservice programs and an observational study of four elementary school classes. The results of this study are summarized in this final report.

The first part of this investigation involved the design and construction

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[1] Kirchner, G. "Simon Fraser University Videodisc Project, Part One: Design and Production of an Interactive Videodisc for Elementary School Children, Videodisc/Videotex, Vol. 2, No. 4. (Fall 1982).

[2] Kirchner, G., Martyn, D., and C. Johnson, "Simon Fraser University Videodisc Project, Part Two: Field Testing An Experimental Videodisc with Elementary School Children", Videodisc/Videotex, Vol. 3, No 1. (Spring 1983).

of a videodisc laboratory for grades five through seven. The second part included two separate inservice programs; one for the four teachers and one for the children of the four participating classes. Part three involved an observational study of four classes during a one-month instructional unit on the heart and circulation system. At the completion of part three, teachers and students completed a questionnaire concerning the videodisc learning system.

Establishment of a Videodisc Laboratory

A spare classroom in a local elementary was designated as the videodisc laboratory. The general layout of this facility, is shown in the accompanying photograph (Figure 1). Portable dividers were used to create three carrels on one side of the classroom. Each carrel contained a colour television set, a

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Figure 1
Floor Plan of the Videodisc Laboratory

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videodisc player (M.C.A. Model 7820) and a remote control unit. The dividers across the back of each carrel allowed the teacher to work with a large group of children in the middle of the room while small groups used one or more carrels to complete independent assignments.

In order to undertake the observational phase of this study, several modifications were made to each carrel. The first was to tape the videodisc manual and remote control unit to the table (see Figure 2). A video camera was then placed above the table and focused on the manual and remote control unit. Throughout part three, video cameras monitored the use of each videodisc player during every lesson for each of the four classes involved in this project.

Figure 1

Floor Plan of the Videodisc Laboratory

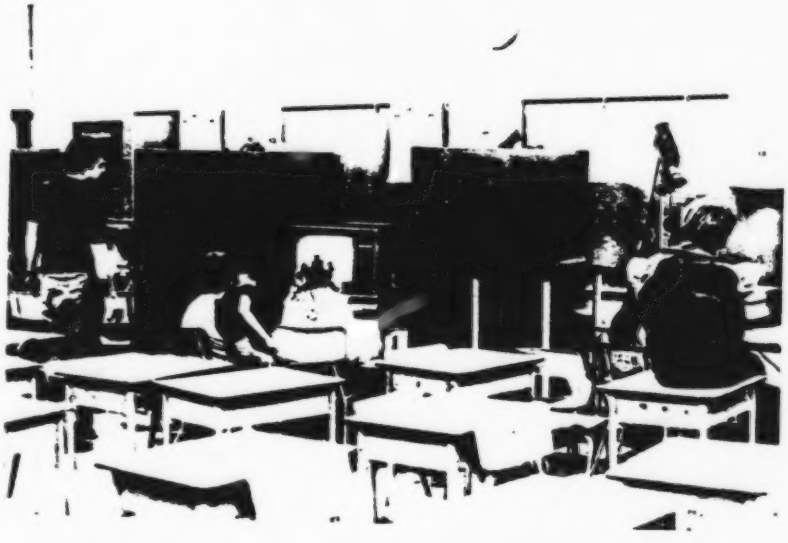


Figure 2
Modified Learning Carrels for the Observational Study

Teacher and Student Inservice Program

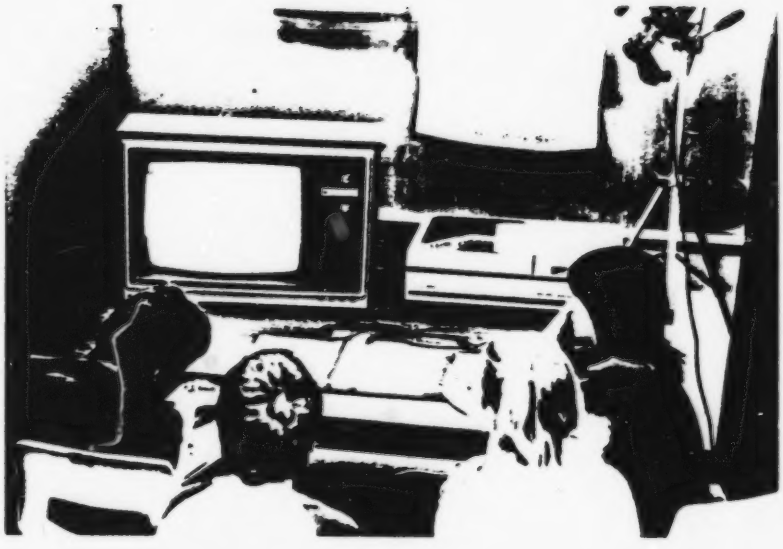
The four teachers who volunteered to participate in this study had no prior experience in teaching the Heart Unit of the Active Health Program. They also had not operated a videodisc player. With respect to the children, only one class had been taught an introductory heart unit the previous year. None of the children, however, had operated a videodisc player. On the basis of this information, coupled with what had been learned from the initial pilot study, two inservice programs were offered during March 1982. A weekly one and one-half hour inservice session was scheduled after school for the four participating teachers. Four forty- minute lessons were scheduled for each class in the videodisc laboratory.

Teacher Inservice Sessions

In order to acquire the knowledge and instructional strategies to teach the Heart Unit as well as learn to operate the videodisc player, the five after school inservice sessions were divided into two parts. Part one was used to familiarize the teachers with the content and teaching strategies of the Heart Unit. All resources, including books, manuals and instructional films, that were available to any teacher through the district resource center, were used during this part of each session. A variety of teaching strategies were also modeled and discussed to provide participating teachers with several approaches of teaching the Heart Unit. Part two was used to learn how to operate the videodisc player. During this part of the session, the videodisc "How Your Heart and Circulatory System Works" was used as a

Figure 2

Modified Learning Carrels for the Observational Study



"practice disc" to learn the various functions of the videodisc player. The accompanying videodisc user's manual was also used to explain and illustrate how to use the automatic and manual mode of operation.[3]

At the end of the fifth inservice session, the four participating teachers were given time to plan a Heart Unit for their classes. No restrictions or specific uses of the videodisc were imposed on these teachers. They were essentially asked to plan a four week heart unit and use the three learning carrels according to their own teaching style. This degree of freedom to plan their own unit and to use the videodisc learning system in their own way ensured a more realistic appraisal of the efficacy of this new technology.

Student Inservice Sessions

During the first three inservice sessions for each class, a member of the project team taught the children how to use the various functions of the remote control unit and to keypunch simple programs. Videodiscs such as "National Kidisc," "Sound of the Dolphins," and "Rock Adventure" were used to teach these skills. The videodisc "How Your Heart and Circulatory System Works" was not seen by any class during these inservice sessions.

A test was administered to the children during their fourth inservice session. Each child was asked to keypunch the fourteen operations shown in Figure 3. Forty-seven of the 114 children who took this test performed these operations without making a mistake. In terms of total responses, class averages ranged from a low of 77% to a high of 89% correct responses. If all four classes were given a short inservice on "STEP FWD" and "STEP REV." (see

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[3] The Videodisc Manual For How Your Heart and Circulatory System Works explains the operating function of the videodisc player and also includes descriptions and frame number locations of all materials contained on the disc.

No. 4 and 5 in Figure 3), the performance level of the children would have been significantly higher.

Figure 3

PROGRAMMING SKILL TEST

MANUAL OPERATION OF REMOTE CONTROL UNIT		CLASS A		CLASS B		CLASS C		CLASS D	
NO.	OPERATION	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect
1	FRM DSP	12	2	11	3	10	2	14	1
2	SCAN FWD	12	2	11	1	10	13	14	3
3	SCAN REV	12	1	11	1	10	9	14	1
4	STEP FWD (3 times)	12	13	11	11	10	7	14	7
5	STEP REV (3 times)	12	9	11	12	10	4	14	6
6	SLOW FWD	12	4	11	1	10		14	2
7	SLOW REV	12	1	11	1	10		14	3
8.	STOP	12	1	11	2	10	3	14	2
9	PROGRAM	12		11	1	10	1	14	
10.	1000 SEARCH	12		11	1	10		14	
11.	1100 AUTO STOP	12		11		10		14	
12.	HALT	12		11	1	10	3	14	1
13.	END	12		11		10		14	
14.	RUN	12		11	1	10		14	2
	TOTAL RESPONSES	168	32	154	37	140	42	196	29
	% RESPONSE	89%	11%	81%	19%	77%	23%	87%	13%

Observational Study

An observational study of four different classes of children began on April 17, 1982 and was completed four weeks later. Throughout this study, video cameras were used to film student activities as they used each

respective videodisc player located within each of the three learning carrels (see Figure 2). A subsequent evaluation of each videotape recording was made using a coded observation form. At the completion of the instructional units, each teacher and all children completed a questionnaire concerning the videodisc machine and the experimental videodisc. The results of the observational study is summarized in the accompanying paragraphs.

Prior to the beginning of the observational study each teacher planned his or her own four week heart unit. This ment that the project team had no prior knowledge of what parts of the heart videodisc would be used, nor how often each of the three videodisc players would be used by each class throughout each of the four units of instructions. To cope with this situation, a member of the project team acted as a participant observer and was present in the videodisc lab whenever it was used by the four classes. As soon as a videodisc player (see Figure 2) was to be used, the project team member turned on the videocamera to record the student(s) manipulations performed on the videodisc machine and remote control unit. The project team member also provided limited assistance to the children with any mechanical operation or with any learning problems relating to the instructional unit.

During the four week instructional unit, a total of 218 separate observations were recorded by the three videocameras. A subsequent observational study of each videotape was conducted to assess the students' proficiency in operating the player and remote control unit and to determine which sections of the videodisc received the greatest use.

With respect to the 218 individual observations as shown in Figure 4, Class A had the largest number of observations while Class C registered only 29 or 13% of the total. During the first 100 observations, the average

Figure 4

OBSERVATIONS OF FOUR CLASSES

CLASS	OBSERVATIONS	
	NUMBER OF OBSERVATIONS	%
A	75	34%
B	70	32%
C	29	13%
D	44	28%
TOTAL	218	100%

viewing time was 20.70 minutes, while the last 100 observations was 13.73 minutes. An analysis of each observation clearly showed a more selective use of the videodisc material and an increased proficiency in operating the player and remote control unit throughout each succeeding week of the instructional unit.

A further analysis of the 218 observations revealed that teachers helped students 223 separate times. The major problem areas related to operating the videodisc machine. Even after teacher assistance, there were 50 obserevations in which mechanical errors in operating the machine were committed by students. The total number of mechanical problems, as shown in Figure 5, was 77, with "removing th disc" representing the main problem. It was interesting to note that 60% of the 50 observations where errors were committed occurred between the first and eighty-fifth observation. The remaining 40% of errors were committed between observation 86 and 218. These scores indicate the mechanical proficiency of all classes improved during the latter part of the instructional unit.

Figure 5

MECHANICAL PROBLEMS RELATING TO VIDEODISC PLAYER

OPERATIONS	CLASS A		CLASS B		CLASS C		CLASS D		TOTAL GROUP	
	No. of Problems	%	No. of Problems	%	No. of Problems	%	No. of Problems	%	No. of Problems	%
Starting the player	14		0		2		2		18	23%
Loading the disc	12		2		1		3		18	23%
Playing the disc	8		0		1		3		12	16%
Stopping the disc	3		0		1		0		4	1%
Removing the disc	11		2		6		6		25	33%
TOTALS	48	62%	4	1%	11	14%	14	18%	77	100%

The data provided in Figure 6 summarizes the frequency of use of specific remote control functions. The difference between the number of "play" and "reject" tallies for each class is due to either the play button not being pressed hard enough to engage the operation or students not pressing the reject button when they finished using the player. In each of the remaining operations, the remote control functions represent "non-class" use by special groups of students. For example, the heavy use by Class B was a group of teacher helpers experimenting with the manual mode of programming material. The data in Figure 6 verifies the fact that only the automatic mode of accessing material was used during the regular scheduled class times in the videodisc laboratory.

Figure 6

FREQUENCY OF USING THE REMOTE CONTROL FUNCTIONS

OPERATION FUNCTIONS OF R.C.V.	CLASS A		CLASS B		CLASS C		CLASS D		TOTAL NUMBER OF TIMES USED
	No. of Observations	No. of times used	No. of Observations	No. of times used	No. of Observations	No. of times used	No. of Observations	No. of times used	
Play	76	195	70	157	29	81	44	59	492
Reject	75	176	70	140	29	74	44	51	439
Step fwd.			2	8	1	2			10
Step rev.			2	9					9
Slow motion fwd.			2	9					9
Slow motion rev.			2	10					10
Search			2	5					5
Scan fwd.	2	10	2	13					23
Scan rev.			3	12					12
Stop	1	1	2	2	1	1			4

A summary of the frequency of use for each chapter is provided in Figure 7. Under the "Number of Individual Uses" column of Chapter 1, there were 54 observations where children viewed the 3-minute motion picture film segment. The score of 14 in the adjacent column indicated that within the 54 observations, there were 14 situations in which children watch the film two or more times. The total frequency of 223 shown under the TOTAL FREQUENCY column represented 202 observations in which the children viewed a particular film segment only once. The remaining 21 observations were situations where multiple viewing was elected by a particular group of children.

The total frequency of use of individual topics within the THINGS TO DO section was 677. Of this number, 45 situations were multiple viewings of a

particular topic. It was also noted that topic four of Chapter 4 was the only one of the 46 topics that was not used by any class. The use of all other topics ranged from 3 to 32 times.

Although the total frequency of 141 for the interactive test was the lowest total frequency of the three different materials contained on this videodisc, it still represented a significant use by the participating classes. An analysis by class indicated all but one class used the interactive test. Of the classes who used the test, the majority of observations revealed the test was taken at the conclusion of the respective chapter.

Teacher Evaluation

After the four teachers completed their respective heart units, they completed a questionnaire concerning the videodisc learning system.

With respect to operating the videodisc player and using the various programming functions of the remote control unit, each teacher felt technically competent and at ease with the videodisc learning system. They attributed their proficiency to the initial inservice program coupled with their experience using the system throughout their instructional units.

In terms of the content of the videodisc and its technical quality, they rated the film material, still frames and the interactive test between good to excellent on a five-point scale. Film material, however, was rated highest, followed by still frame sequences, then the interactive tests. Their opinion of the automatic mode for locating and playing material was equally divided between the good and excellent rating. Finally, the value of the accompanying user's manual was given a very positive rating by all teachers. They found the "How to Program" section in the first part of the manual helpful when reviewing modes of operating the videodisc.

Table 7

FREQUENCY OF USE FOR FILM, THINGS TO DO AND THE INTERACTIVE TEST

CONTENTS		CHAPTER 1 Frequency of Use		CHAPTER 2 Frequency of Use		CHAPTER 3 Frequency of Use		CHAPTER 4 Frequency of Use		CHAPTER 5 Frequency of Use		CHAPTER 6 Frequency of Use		TOTAL
		Number of Individual Uses	Number of Multiple Uses during a Single Observation	Number of Individual Uses	Number of Multiple Uses during a Single Observation	Number of Individual Uses	Number of Multiple Uses during a Single Observation	Number of Individual Uses	Number of Multiple Uses during a Single Observation	Number of Individual Uses	Number of Multiple Uses during a Single Observation	Number of Individual Uses	Number of Multiple Uses during a Single Observation	
Film* Segment		54	14	40	2	33	2	21	1	30	2	15	0	223
Things To Do	Topic 1	11	0	19	0	17	3	31	3	15	0	7	0	
	2	27	3	18	1	18	0	24	2	13	5	6	0	
	3	8	1	20	0	21	0	23	1	6	0	6	0	
	4	32	6	16	2	15	1	16	3	0	0	6	0	
	5	5	2	15	0	18	4	19	1	9	0	7	0	
	6	29	0			22	3	7	1			6	0	
	7	20	1					3	0			5	0	
	8	7	0									5	1	
	9	16	0											
	10	13	0											
	11	11	0											
	12	11	0											
	13	10	0											
	14	9	0											
	15	10	1											
TOTAL		219	14	88	3	111	11	123	11	43	5	48	1	677
INTER-ACTIVE TEST		31	3	32	0	18	1	21	2	16	2	13	2	141

* The introductory film segment prior to Chapter 1 was used 9 times.

When asked their opinions about the effectiveness of the videodisc as a learning system, their reactions were consistently positive. Each teacher was impressed with the technical advances such as slow motion, scan, step fwd and freeze framing. Rapid access to material was singled out as a highly desirable feature. The capacity to use automatic or manual modes of operation also allowed them to provide for individual differences in abilities and interests. Although they rarely used the program mode, they did indicate this feature would be used more often in the future to design individualized or what they termed "tailor made" programs. This latter statement represents the teachers' understanding and appreciation of the multidimensional learning potential of the videodisc. Finally, when asked to compare the videodisc with other audiovisual aids, they considered the videodisc to be more versatile and superior in virtually every way to other audiovisual aids such as the 16 mm projector or videotape players.

Student Evaluation

At the completion of the instructional unit each student was asked to complete a questionnaire. The questions attempted to determine students' general attitude towards the player as well as towards the content and arrangement of the experimental videodisc. A summary of this questionnaire is provided in the accompanying paragraphs.

The first two questions were concerned with frequency of viewing the videodisc and the frequency of operating the player or remote control unit. Question one asked, "How many times did you watch the videodisc "How Your Heart and Circulatory System Works?" Question two requested "How many times did you use the controls or get to push buttons?" According to Figure 8, the

Figure 8

MEAN SCORES FOR QUESTIONS ONE AND TWO

	Class A Mean	Class B Mean	Class C Mean	Class D Mean	Total Group Mean
Question 1	4.95	7.20	8.12	11.37	7.95
Question 2	3.50	4.50	8.12	2.04	4.58

number of times children in each class used the videodisc varied from an average of nearly five times for Class A to almost double that for Class D (11.37). When you look at the mean scores for Question two, Class D's score was significantly lower than the other classes. When we investigated this situation, the teacher had assigned all children on an equal basis to each machine.

Question three stated "How many times did you use the User's Manual?" Of the 94 students responding to this question, 67 students representing 71% of the total group never used the manual. A follow-up to this question revealed that all teachers used the manual to plan what they wanted children to see in different chapters of the videodisc. Further, each teacher prepared work sheets that were essentially simplified sections of the user's manual. This information clearly indicated the accompanying user's manual needed to be rewritten in a more simplified version for student use.

Question four asked the students "How easy were the following parts for you?" They replied on a five-point scale with 1=very hard, 2=hard, 3=comfortable, 4=easy, and 5=very easy. The mean scores, tabulated in Figure 9, indicated that children did not forget what they had learned during the inservice session and appeared to develop an increased competence during the instructional unit. Even though some classes, such as Class C rarely used the

remote control unit during the instructional unit (see question two) they continued to display a sense of competence and confidence in operating the player throughout the observational study.

There were two parts to question five. The first part asked "Did you have any trouble operating the videodisc machine?" Seventy-one students representing 75.5% of the total group indicated they had no trouble. When asked to explain where they had trouble, the main problem areas for the twenty-three students who experienced trouble were restricted to loading, unloading and pressing the wrong button. With respect to the number of responses, four related to loading and unloading, three concerned pressing the wrong button and the remaining ten comments were concerned with the videodisc rather than operating the machine.

Question six requested children to indicate whether they liked or disliked the videodisc machine and sections of the heart videodisc. On the basis of a five-point scale, as shown in Figure 10, student reactions were generally positive towards the player as well as towards the various parts of the heart disc. The reason for this positive attitude towards the interactive test may be due to its non-threatening aspect since no score was kept coupled with the positive reinforcement that is provided as the student answers each question. The relatively low 3.4 mean score for "Things to do" is an acceptable rating; however, the tallies towards the lower end of this scale would indicate a closer look at how still frame material should be arranged and presented in future videodiscs.

As part of question six, children were asked "Is there anything else you liked or disliked?" The comments that were written reinforced the tallies recorded in Figure 10. The major number were written about the test, then the

Figure 9

EASE OF USING PLAYER AND R.C.U.

Videodisc Player & Remote Control Operation	AVERAGE SCORE				
	Class A	Class B	Class C	Class D	Total Group
Loading the Player	4.75	4.40	4.28	4.60	4.50
Starting the Player	4.75	4.60	4.62	4.62	4.60
Playing the Disc	4.50	4.35	4.31	4.75	4.70
Removing the Disc	4.79	4.60	4.48	4.54	4.60
Finding Table of Contents	4.54	4.36	3.70	4.62	4.30
Finding Chapter Decision Frames	4.29	4.30	3.38	4.29	4.00
Finding Things to Do	4.54	4.50	4.00	4.58	4.40
Finding Test	4.29	4.54	4.00	4.67	4.30
Using Automatic Mode	4.00	3.60	3.56	3.83	3.70
Making Programs	3.95	3.94	3.50	3.54	3.70

Figure 10

FREQUENCY OF RATINGS

VIDEODISC & PLAYER	Frequency Of Ratings					
	1 Really Disliked	2 Disliked	3 Alright	4 Liked	Really Liked	5 Mean Score
The Active Health Disc - Heart	3	5	44	24	14	3.4
Videodisc Machine	0	1	10	22	57	4.5
The Films	1	4	31	30	24	3.8
The Things To Do	3	9	37	23	18	3.4
The Test	1	5	18	18	48	4.1

film and finally about "Things to Do." The most common statement was "I like to press buttons." A few negative comments were directed towards not being able to operate the machine and the noise of other children and machines.

Question seven asked "Did you like any part better than others? . . . Which parts?" Half of the total group or 47 children said yes. Again this reinforced the answer to the previous question only in more detail. The overwhelming positive response was toward the interactive test. Of the twenty-nine children who were positive towards the interactive test, their reasons were "It's fun," "learn more," "I was active," and "I liked pressing buttons." It was interesting to note that 12 students liked all the material. Their comments were "every part was equally good," "all the same," and "liked the whole thing."

The eighth question asked "What would you like to see more of in the heart disc?" Twenty-seven children indicated they would like to see more test items. Eight children said they would like more motion picture material with specific references to film of a "live heart," "real circulation of blood," and "live dissections of frogs and animals." Five children were interested in more written material that included pictures and diagrams.

The ninth question allowed children to express their opinion to "What would you change if you could on the heart disc?" Fourteen children left this blank, 45 said "change nothing" and the remainder suggested "more tests," "less reading in Things to Do," and "longer film" as their main suggestions.

The last question asked" Did you learn a lot from the videodisc?" Of the 94 responses, 89 said yes, 4 said no, and 1 child left it blank. Three of the 89 children who responded with a "yes" added phrases such as "most of the time," kind of," and a "sort of."

DISCUSSION

Results of this field test study confirmed several findings of the initial pilot study as well as provided answers to other important questions concerning the material on the videodisc and accompanying user's manual.

With respect to instructing elementary school teachers how to use the videodisc player and to program material, three to five, one hour inservice sessions are required to learn the three program modes. Students can learn the basic functions of operating the player and to program material, either automatically or manually within four half-hour sessions.

The observational study produced several important findings that should assist future in-school videodisc projects. When teachers are given the choice, the automatic mode of accessing and playing material will occur far more than manual modes. The reasons are quite obvious; its less time consuming and easier to use than the manual mode, Initial program use will be somewhat general and run for a long duration during the first few lessons. Gradually, teachers and children become more selective with material and view it for shorter periods of time. With respect to recurring sources of difficulties, a negligible number of students found difficulty in locating or pressing the correct button.

With respect to the nature of the subject area involved and the age of the children, the use of the interactive test and film segments clearly reveal the type of audiovisual materials that are popular with young children. The interactive test was popular for two important reasons. First, children enjoy manipulating machines, hence the test items met this criterion. Secondly, the test was non-threatening, that is, children could make mistakes as well as be shown the correct answer before moving to the next question.

The teacher evaluation of the videodisc learning system were consistent with previous studies. Each teacher was impressed with the multidimensional features of the system as well as with the operations that could be programmed through the remote control unit.

The student evaluation form produced several important findings. Their attitude towards this new learning system was as positive as the teachers'. Students indicate they had little difficulty operating the machine or following the automatic mode. With respect to what they liked, the videodisc machine was given the highest rating. This was followed by the interactive test, the film, and finally Things to Do. Children of this age range appear to like to be entertained as they learn. Yet when asked what they would change on the disc, almost 60% of the total group left this blank or said "change nothing." We can conclude that they like lots of material that is enjoyable and requires manipulating buttons but they recognize the value of "less exciting" still frame material that can be accessed in a couple of seconds and displayed for an indefinite period of time.

The essence of the project is summed up in the question "Did you learn a lot from the videodisc?" Of the 94 children, 89 said yes, 4 said no, and 1 child left it blank. A 94% positive response to this question coupled with unsolicited comments such as "I hope I do it again," and "It was fun" would indicate the videodisc learning system may well have a strong role to play in future educational programs.

Recommendations

1. Similar studies, involving other subject areas be conducted to evaluate teacher and student use and reaction to this learning system.
2. Placement of videodisc players and educational discs into selected classrooms for extended periods. The purpose of such studies would be to ascertain the group and individual instructional use of this system.
3. Repeat above type studies with the Apple Computer control. This interface will provide more versatility of use than is currently available with the program storage capacity of the Pioneer 7820 microprocessor.

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